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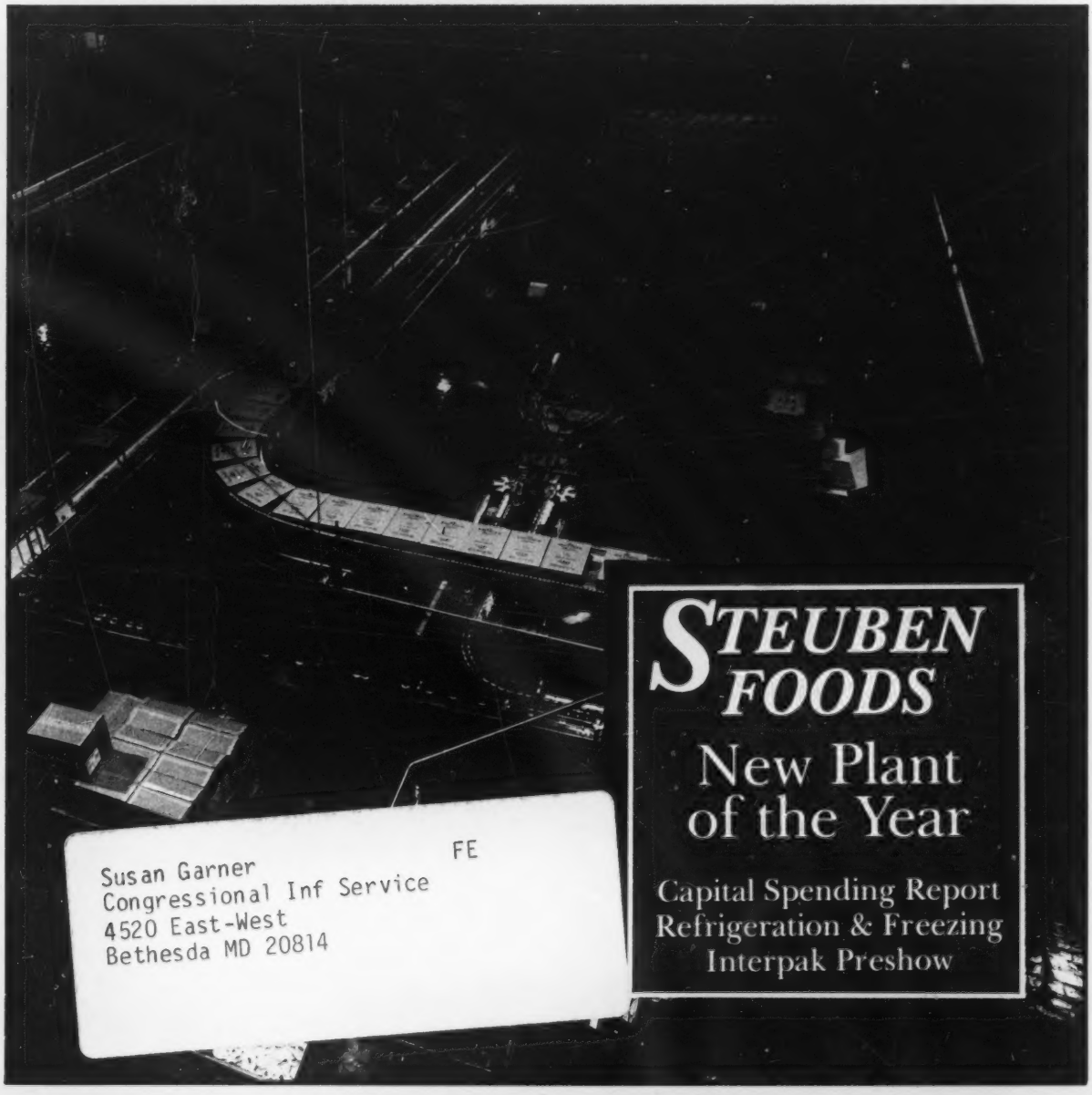

STEUBEN FOODS

New Plant of the Year

Capital Spending Report
Refrigeration & Freezing
Interpak Preshow

FE
Susan Garner
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4520 East-West
Bethesda MD 20814

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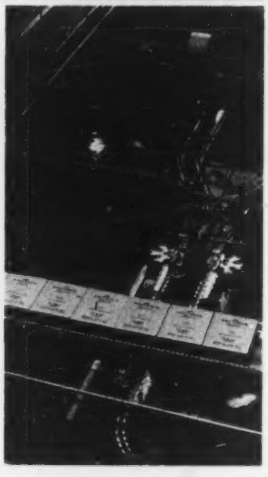

COVER STORY
Steuben Foods, a high-tech yogurt plant and anchor of the planned "agribusiness" center of Western New York, is *Food Engineering's* choice for this year's new plant of the year.

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12 Industry Report
This month's Report features news from the NFPA conference discussions on low-acid, refrigerated, extended shelf life products and their growing market; why playing politics is crucial for the food industry; the U.S./U.S.S.R. Trade Council; and why keeping up with technology is necessary for the competitive food processor.

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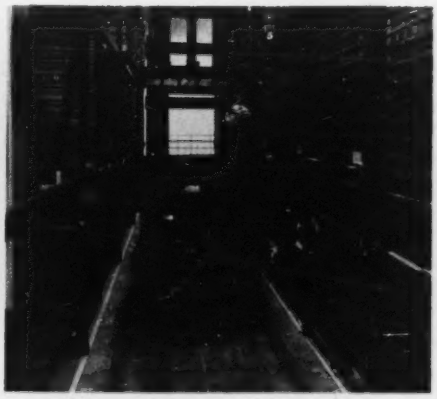

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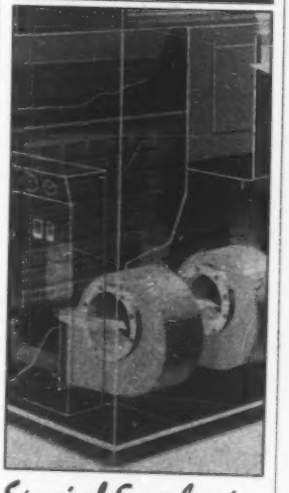

Special Emphasis

REFRIGERATION AND FREEZING GAIN NEW EMPHASIS

Refrigerated foods are riding the crest of a consumer trend that views fresh as the key to better nutrition and taste.

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EQUIPMENT BUYERS' SURVEY

Our measure for the coming year of the budgets, preferences, schedules, and attitudes that drive the people who make the technology buying decisions in the food industry. Where does your company stand?

This year's Executive Advisory Panel Equipment Buyers' Survey drew 315 usable responses from a Panel mailing of 640, and we generated 154 pages of tables. The members of the Panel have been individually selected to be able to provide us with information that is representative by size of company, segment of industry, and category of decision maker. It is through this representative sample of expert opinion that we can get results that we feel mirror actual market conditions. And we thank the Panel for its continuing support.

In 1986, the headline for our Equipment Buyers' Survey (see the January '86 issue) reported that "We're Going For It." Well, this year it looks like the momentum is still there. Overall, for example, 67.9 percent of our Panel projected production increases at their locations for 1987.

There was even more optimism when the respondents were asked to look at their companies as a whole: 85.7 percent saw company productivity as making some gain. A substantial part of those people saw gains over 10 percent to be the rule: 30.5 percent of the respondents discussing their individual locations, and 33 percent of those discussing their companies.

It is necessary, perhaps, to temper the enthusiasm of some of our respondents with the fact that realistically the food industry overall in 1987 will probably not show much more than a 3 percent rise in shipments. Still, the survey shows a great many people looking forward to major growth in their businesses, and obviously committed to making it happen. As we have seen in 1986 with the rapid growth of categories that a couple of years ago hardly existed, like shelf stable low acid refrigerated takeout foods, the companies that take advantage of opportunity are nowhere near exhausting their capabilities or slowing down because of what may look to be mature segments.

In looking at the numbers by company size, it is the smallest companies that are most positive about large increases. Over 35 percent of them feel they are looking at more than 10 percent increases in production, while only about 21 percent of the largest companies surveyed felt the same way. This is not unusual, since smaller companies start from a smaller base in tallying up their percentage increases. Also, if the smaller company is well run, it is more flexible than a large one in being able to take advantage of market opportunities.

CHARLES J. HABERSTROH
Editor-in-Chief

What they'll spend

You can't go for big increases without pressing more capital into service; and according to our Panel, spending will continue in 1987 much as it did in 1986, with two exceptions at opposite ends of the spectrum. The percentage of respondents who indicate that their company will spend under $100K on equipment went from 11 percent last year to 17.4 percent this year. Redressing the balance somewhat on the other end, 48.6 percent of the respondents said their companies would spend over $1M, compared to 44 percent last year (in fact, 28.6 percent of the respondents indicated their companies would purchase in excess of $5M worth of equipment).

And as one of the accompanying charts shows, the percentage of companies throwing big dollars against production improvement rises dramatically as the size of the company goes up. Only 10.1 percent of the survey respondents who worked for companies with fewer than 100 employees projected purchases in excess of $5M. But 58.1 percent of those in companies with 500 or more employees felt they were looking at equipment bills of over $5M this year.

The top spenders by segment – the highest concentrations of companies spending $1M or more – were the meat people (55.7 percent), the dairy folks (55.4), canned products producers (58.6), and producers of fats and oils (57.1). Considering how the meat segment is reviving itself, how dairy products are proliferating as the industry looks for more value-added niches, and the aggressiveness of canned products people like Del Monte, these numbers for these segments are not surprising.

Where the priorities lie

The high activity that will be going on in equipment purchasing will be going on, in general, in those technologies that cut across industry segment. For this reason, the highest across-the-board purchase priorities were given to sanitation equipment (rated 2.23 out of 3.0 on a company-wide

need basis). Next came process instrumentation (at 2.19), filling equipment (at 2.05), valves and fittings (1.99), pumps (1.97), and on-line QC (1.94).

These priorities, of course, varied by industry segment. For example, 33.3 percent of the frozen food segment respondents felt machine vision was a high priority item for them in 1987, as did 29.3 percent of the beverage people; but only 21.3 percent of the cereal segment felt the same way. On the other hand, it was the cereal people who felt the most pressing need for improved instrumentation and process control, with 41 percent voting it a high priority, while only 28.2 percent of the frozen food segment felt that way, and 34.7 percent of the beverage segment.

Still, it was a bit surprising that instrumentation was not a higher priority than it was, and that on-line QC, a hot area for product development, rated after valves and pumps. It is hard to say whether this is because companies are becoming used to those technologies; because not enough companies are still fully aware of what these technologies can do; or because a great deal of the equipment being produced already has the instrumentation (at least the PC instrumentation) capabilities built in.

What makes them buy?

We asked respondents to rate purchase influences on a scale of one to four. We

(Continued on page 76).

Reading our numbers

Charts have been written to read across from left to right, with the items in the left-hand column as the base of comparison. For example, the chart on this page showing Production Projections, 1987, By Company Size indicates that of those respondents in companies of under 100 employees, 1.0 percent projected more than a 10 percent decrease in production.

Production Projections, 1987, By Company Size

Projections are for company-wide production increases/decreases compared to 1986.

Under 100 employees	1.0%	0.0	1.0	11.1	3.0	23.2	35.4
100-499	0.8	0.8	3.1	7.1	17.3	23.6	33.1
500+	4.7	2.3	1.2	9.3	18.6	25.6	20.9

**Percentages may not add up to 100% because of multiple responses or partial responses.

Source: Food Engineering Equipment Buyers' Survey

Production Projections, 1987, By Segment

Projections are for company-wide production increases/decreases compared to 1986.

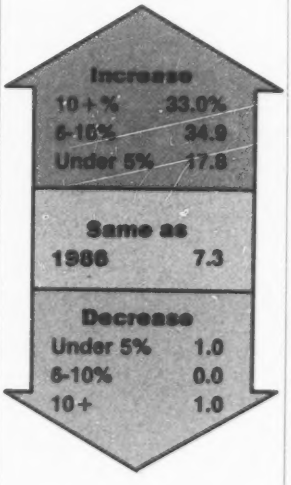
Meat	0.0	0.0	1.3	11.4	13.9	27.8	41.8
Bakery	1.2	0.0	0.0	6.1	17.1	31.7	37.8
Dairy	0.0	0.0	1.0	6.9	18.8	28.7	38.6
Flavors/ ingredients	0.0	0.0	0.0	7.4	13.2	36.8	41.2
Canned products	0.0	0.0	0.0	6.9	17.2	37.9	36.2
Fats/oils	0.0	0.0	0.0	10.2	16.3	51.0	20.4
Frozen products	0.0	0.0	2.6	7.7	17.9	30.8	35.9
Confect-ionery	0.0	0.0	0.0	5.6	20.4	42.6	31.5
Cereals/ grain	1.6	0.0	0.0	6.6	23.0	44.3	23.0
Beverages	0.0	0.0	0.0	8.0	24.0	38.7	25.3
Other	2.2	0.0	0.0	4.3	19.4	32.3	35.5

**Percentages may not add up to 100% because of multiple responses or partial responses.

Source: Food Engineering Equipment Buyers' Survey

Production Projections, 1987

Projections are for overall company-wide production increases/decreases compared to 1986.

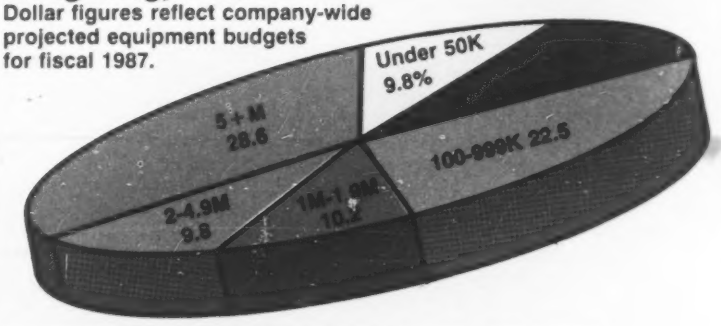


**Percentages may not add up to 100% because of multiple responses or partial responses.

Source: Food Engineering Equipment Buyers' Survey

Budgeting, 1987

Dollar figures reflect company-wide projected equipment budgets for fiscal 1987.



**Percentages may not add up to 100% because of multiple responses or partial responses.
Source: Food Engineering Equipment Buyers' Survey

Budgeting, 1987, By Company Size

Dollar figures reflect company-wide projected equipment budgets for fiscal 1987.

Under 100 employees	27.3%	14.1	21.2	6.1	7.1	10.1
100-499	2.4	6.3	33.9	12.8	11.8	22.8
500+	1.2	2.3	8.1	10.5	10.5	58.1

**Percentages may not add up to 100% because of multiple responses or partial responses.
Source: Food Engineering Equipment Buyers' Survey

Budgeting, 1987, By Segment

Dollar figures reflect company-wide equipment budgets for fiscal 1987.

Meat	10.1	8.9	17.7	15.2	8.9	31.6
Bakery	13.4	13.4	15.9	7.3	3.7	31.7
Dairy	7.9	10.9	16.8	6.9	11.9	36.6
Flavors/ ingredients	14.7	13.2	22.1	8.8	10.3	25.0
Canned products	3.4	13.8	19.0	8.6	10.3	39.7
Fats/oils	16.3	8.2	14.3	6.1	16.3	34.7
Frozen products	12.8	12.8	15.4	5.1	5.1	38.5
Confect-ionery	7.4	9.3	25.9	7.4	9.3	35.2
Cereals/ grain	13.1	8.2	16.4	6.6	8.2	37.7
Beverages	10.7	12.0	14.7	5.3	6.7	37.3
Other	8.6	9.7	23.7	9.7	15.1	21.5

**Percentages may not add up to 100% because of multiple responses or partial responses.
Source: Food Engineering Equipment Buyers' Survey

wanted to find out not just where their priorities lay, but to get a better fix on what makes them buy one piece of hardware rather than another.

The heavy hitting factors, in order of strength, were service by supplier, payback period, training by supplier, supplier reputation, fast line changeover capability, and price. All of these, with the exception of price (which only came in sixth), involve a food manufacturer's perception of the support available from the supplier, and the productivity of the machinery. The likelihood of this changing in the near future, particularly with increased competition, is practically nil. In fact, as time goes on, manufacturers will be more and more concerned with the level of service provided by equipment suppliers.

The purchasing clock

One of the survey's most dramatic examples of the flexibility of the small and midsize company had to do with how fast, from start to finish, it took to get new equipment in, up, and running. In general, small and mid-sized manufacturers were about 30 percent faster than their large counterparts when it came to getting in custom machinery, and more than 25 percent quicker with stock items that perhaps needed only a few minor modifications.

By far the largest block of time is that spent from the time an agreement is reached with a supplier to the time the equipment is delivered. The least chunk of time is the in-plant shakedown of the equipment and the training that goes along with it. Still, this can vary anywhere from about a month and a half to two and a half months depending on the type of equipment and the size of the operation it is going into. The same is true for the time it takes for setting the performance specs. The preliminary meetings, on the other hand, can take anywhere from two to almost five months, while locating a supplier and reviewing equipment is another two to three months. All in all, it will take a minimum of seven months and up to a maximum of almost 15 months to get it done.

What this shows also is that while a small company can react more quickly, not even a small company can be turned on its heel to abruptly exploit a new market if that opportunity involves an equipment purchase. And if a large company is going to move into a new technology to improve its productivity, it might be two years before any evidence of a change will show because it could

(Continued on page 78)

take them a year and a quarter just to get the technology in place. This is why two things are important, particularly for a large company--strategic planning, and the decentralization of operating units.

What makes it go?

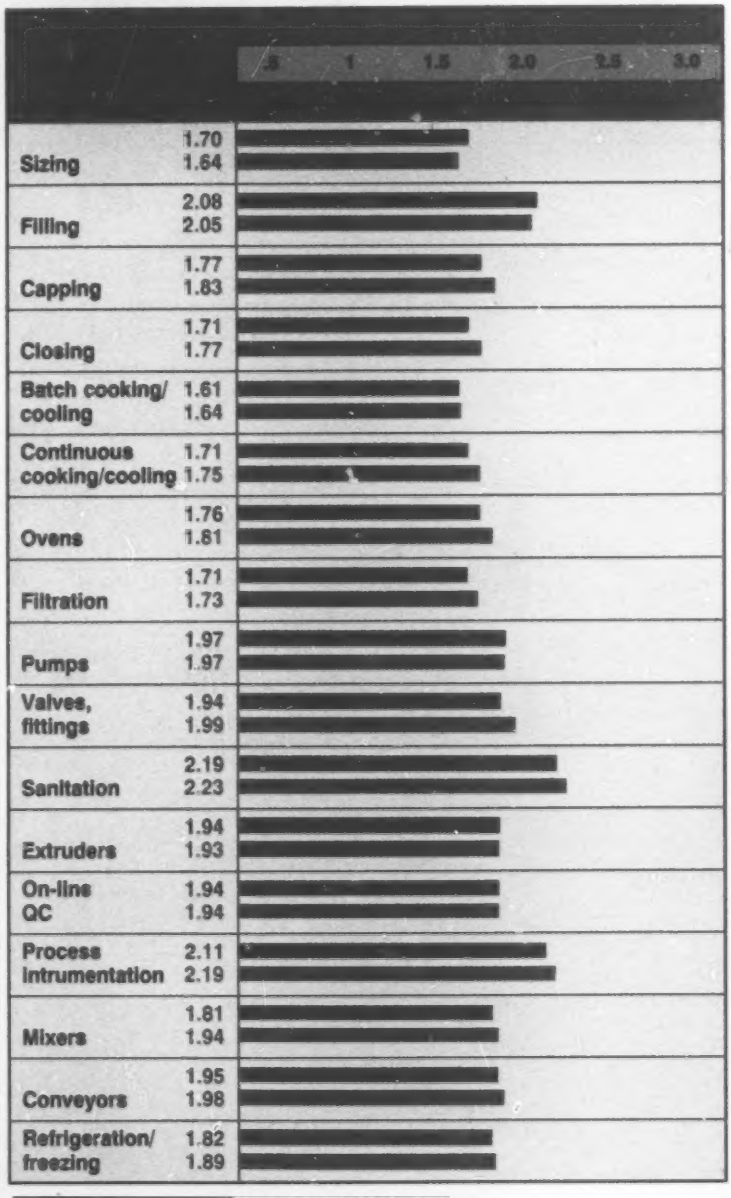
The last major block of information we wanted to put some measure to was the matter of the forces within a company that drive the decision for replacing or upgrading capital equipment. We asked each of the major departments that might have a hand in the process to rate various factors.

This is a situation where the average answers are misleading. On the average, the levels of importance assigned to the four factors we asked about were very close on a scale of one to three: Need for new products (2.69), engineering's mandate to improve productivity (2.35), the need for increased capacity because of expansion of markets (2.36), and health and safety concerns (2.40).

Where you begin to see significant differences is when you start to look at how many people considered each of those factors major. It is here that the numbers related to the marketing and new product sectors of the companies begin to stand out. This is where we get that curious dichotomy in the decision-making process: Even though marketing does not make machinery specifying decisions, it is an enormous motive force in why things happen. For example, 63.2 percent of the respondents felt that the needs of marketing were a major factor in why things happen at food companies in the equipment purchasing areas. In fact, interestingly, more of the engineering people (70.7 percent) saw it that way than market-

Purchase Priority, 1987

Figures represent where on the priority scale people using the equipment below placed the buying of that equipment. Figures are for both their location, and company-wide.



Source: Food Engineering Equipment Buyers' Survey

Motive Forces

The figures indicate the ways in which respondents rated the factors below according to their perceived importance in bringing about a change in technology or in manufacturing procedure.

The marketing need for new products	3.8%	19.4	63.2
Engineering need to improve productivity	6.7	43.2	36.8
Need for increased capacity for new markets	9.5	36.2	40.6
Health & safety concerns	5.1	42.2	39.4

**Percentages may not add up to 100% because of multiple responses or partial responses.
Source: Food Engineering Equipment Buyers' Survey

Factors Influencing Purchases

Numbers indicate the average influence rating each group of decision makers gave the factors below.

Case studies in the media	2.19	2.15	2.18	2.26	2.17	2.27	2.12	2.18
Supplier catalogs, lit	2.30	2.30	2.22	2.34	2.38	2.29	2.23	2.24
Payback period	3.32	3.32	3.46	3.37	3.53	3.31	3.36	3.27
Fast line changeovers	3.05	3.15	3.07	3.19	3.15	3.09	3.25	3.00
Parts inter-changeability	2.48	2.45	2.44	2.61	2.51	2.44	2.42	2.51
Modularity (quick tear-down, service)	2.98	2.99	3.00	3.03	3.04	2.96	3.04	3.11
Lease/buy option	1.98	2.06	1.92	2.08	1.76	2.11	1.90	2.11
Process control adaptability	2.46	2.58	2.65	2.54	2.73	2.51	2.55	2.31
Supplier reputation	3.18	3.20	3.22	3.27	3.27	3.23	3.24	3.18
Price	3.12	3.25	3.22	3.24	3.08	3.21	3.18	3.18
Service by supplier	3.46	3.45	3.49	3.51	3.50	3.45	3.55	3.33
Training by supplier	3.19	3.17	3.16	3.19	3.14	3.21	3.26	3.16
Past experience with equipment	2.71	2.86	2.74	2.76	2.77	2.77	2.74	2.67

Source: Food Engineering Equipment Buyers' Survey

ing people (52.5 percent). In large companies the impact of marketing on the manufacturing mindset was greatest, with 81.4 percent of respondents from companies with 500 or more employees saying that marketing was a major factor.

As far as the number of respondents that felt engineering's mandate to improve productivity was a major factor, the response was about half (36.8 percent) of what it was for marketing needs. The need for increased capacity to open new geographical markets came in at 40.6 percent; and health and safety concerns came in at 39.4 percent.

And so, 1987 will be one to watch. There will be no abatement in the competitive rigors that pushed the market through '86; and those rigors will mean companies keeping their technology in tune, and in fact having to predict where the next technological move will be (see our Industry Report story on p.13 about coping with what one executive calls the technology "discontinuity gap"). Equipment and technology are the doors to the future. When the future comes, which side of the doors will you be on?

Equipment Purchase Time Frames

Figures represent average number of months for each stage of the purchasing decision process. Figures also represent time frames for custom-produced versus stock equipment.

Preliminary meetings	3.75 1.92	3.48 2.13	4.82 2.79
Setting per-formance specs	2.43 1.56	2.42 1.83	2.41 1.58
Locating sup-pliers, pricing, reviewing equipment	2.64 1.89	2.96 2.18	3.11 1.77
Time from ag-reement to delivery	3.81 2.40	4.66 3.25	6.15 3.64
In-plant shake-down and training	1.91 1.63	2.38 1.73	2.41 1.57
Total time	11.29 7.14	11.89 7.82	14.81 9.03

Custom-produced equipment
Stock equipment (with minor modifications)

Source: Food Engineering Equipment Buyers' Survey

REFRIGERATION & FREEZING GAIN NEW EMPHASIS

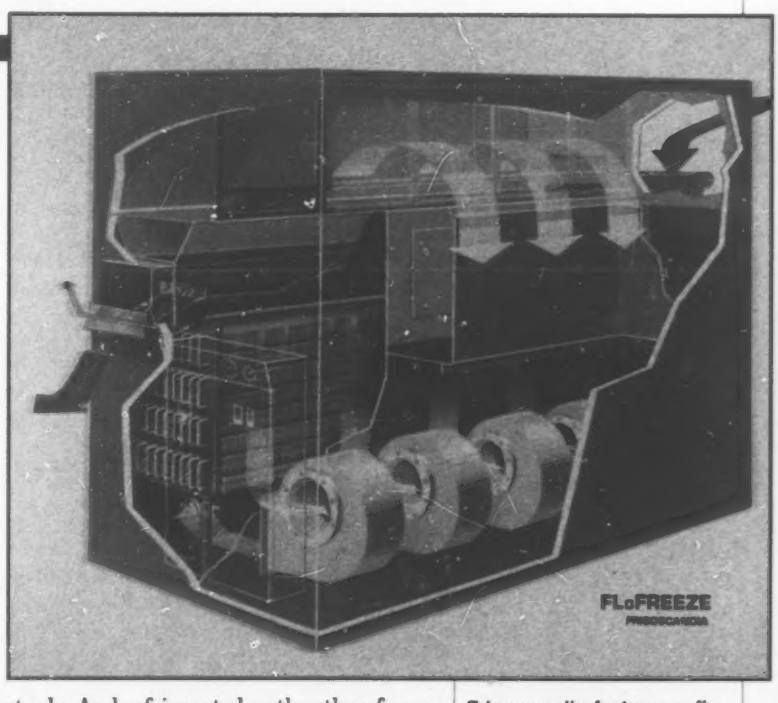
In the midst of a convenience- and freshness-driven market, producers are turning more and more to frozen and refrigerated foods, and more efficient refrigeration and freezing systems.

Are we still in the middle of a frozen food boom? According to figures from *Quick Frozen Foods International,* the boom has been flattening out, with only a 2.9 percent increase in tonnage from 1984 to 1985. More surprisingly, prepared foods, supposedly the focal point of new frozen products, had only a one percent growth rate.

On the other hand, according to the Food Institute and information released by SAMI, frozen and refrigerated foods are enjoying a surge in popularity. The refrigerated aisle is a particularly "hot" section, because consumers are willing to pay for increased convenience. Additionally, refrigerated foods are riding the crest of a consumer trend that views fresh as the key to better nutrition and taste appeal. Many manufacturers are entering the refrigerated foods field, e.g. Campbell with refrigerated soups and sauces, and Pillsbury with Azteca brand refrigerated Mexican foods. Overall, the refrigerated foods department reported increased tonnage of 12.5 percent in the latest 12-week reporting period, ending October 10, 1986. Refrigerated orange juice led the category with an increase of 30 percent, reflecting the convenience trend.

It would appear from the figures that there is a lot of activity within an overall steadily growing category. With freshness and convenience driving the market, there seems to be a shift towards items requiring less preparation time. Dual-ovenable trays and smaller sizes have become a market staple. And refrigerated, rather than frozen entrees are appearing.

BILL DRENNAN
Senior Editor



Frigoscandia features a fluidizing IQF system which distributes air through a specially perforated stainless steel tray in the freezing zone. The bed of upward-blown polar air supports, transports and individually freezes each particle in the product flow.

Changes in equipment

According to George Briley, of Refrigeration Engineering Co., one improvement in the refrigeration field has been screw compressors. New compressors are becoming increasingly versatile and energy efficient. Recently a microprocessor-controlled variable volume screw compressor has been introduced. The unit senses the discharge pressure and suction pressure and adjusts the compressor to its optimum point. This

(Continued on page 86)

This refrigeration engine room contains reciprocating ammonia compressors from APV Crepaco. The units feature lightweight aluminum pistons and connecting rods and can provide a 5 to 15% energy savings.

saves energy by optimizing the energy input to the compressor. The energy savings can be as high as $10,000 per year.

Another development that has occurred recently is bearing improvements. Cylindrical roller bearings are provided to handle the radial loads with the thrust loads absorbed by angular contact ball bearings. In addition, balance pistons are provided to reduce the thrust load and lengthen the life expectancy of the bearings. The design-rated bearing life of the antifriction bearings is in excess of 100,000 hours. This bearing system reduces frictional losses and has superior rotor positioning capabilities, thus reducing power consumption, particularly at higher pressure ratios.

Briley says to look for smaller units in the 10 hp to 125 hp range coming soon with excellent efficiencies (possibly even better than reciprocating compressors). And, new rotor profiles will assure better efficiencies for larger screw compressors.

Vilter Manufacturing Corp. has introduced a versatile reciprocating compressor, capable of handling a wide range of applications. Its design allows it to be used with virtually any industrial refrigerant at compression ratios of up to 8:1 with ammonia and up to 14:1 with some halocarbons.

Joe Briede of Alamo Refrigeration says that refrigeration engineering companies are becoming more and more involved in the processing cycle. "For instance," says Briede, "the almost endless variety of convenience foods created over recent years need to be properly accommodated in the selection of freezing or cooling equipment." Alamo features freezing tunnels with adjustable retention times for different types of products or packages.

IQF units

Interest is very high in individual quick freezing units that are incorporated into a processing line. Vegetables and meats, in many instances are first frozen, then packaged. There is a booming market for Mexican, Central and South American vegetables. This so-called "stoop vegetable" business is a boon to the economies of these Latin American countries. The vegetables are harvested, then individually quick frozen, and shipped to markets in the States. A number of U.S. companies have established plants in these countries to take advantage of an almost year-round growing season. IQF freezers are also used for such items as chicken parts and finger foods.

IQF freezers are designed for odd-shaped products, products that are to be frozen individually, and continuous processes. Product is taken by conveyor through a freezing compartment. The more dwell time that is required, the longer the conveyor that is

(Continued on page 89)

1985 Estimated U.S. Poundage, Tonnage and Value For All Frozen Foods by Category All figures in Millions

	Poundage			Kilograms			$ Value		
	Retail	Instit'l	Total	Retail	Instit'l	Total	Retail	Instit'l	Total
Prepared Foods	4,277	1,601	5,878	1,940	726	2,666	$8,540	$2,501	$11,041
Fish & Seafood	589	1,496	2,085	267	679	946	2,257	8,405	10,662
Vegetables	2,057	5,874	7,931	922	2,665	3,598	1,885	3,380	5,265
Juices & Drinks	1,562	1,281	2,843	709	581	1,290	2,116	1,315	3,431
Poultry	2,182	1,231	3,413	990	558	1,548	2,404	1,253	3,657
Meat	517	1,016	1,533	234	461	695	838	2,208	2,866
Fruits	71	750	821	32	340	372	83	613	696
Total	11,255	13,249	24,504	5,105	6,010	11,115	$18,123	$19,495	$37,618

Source: Quick Frozen Foods Int'l

used. For items that require longer dwell times, spiral freezers are often used. These consist of a spiral conveyor inside the freezing compartment, which ensures proper dwell time without taking up a lot of space.

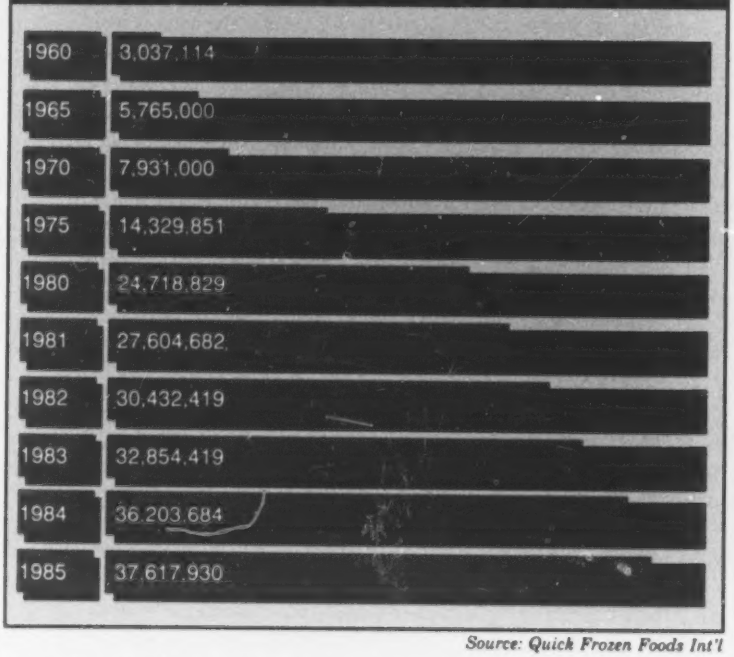
Refrigeration Engineering Corp. has introduced a *Dual Air* spiral freezer which is a combination of both vertical and horizontal air flows arranged in a counter flow configuration (product movement is counter to the air flow). According to the manufacturer, the system provides greater yield through less dehydration and greater economy of operation through more efficient use of the refrigerated air. Less air must be moved to do the work, requiring less fan horsepower. The system is capable of self-adjusting from horizontal to vertical air flow when product loading so dictates.

Frigoscandia's *GYRoCOMPACT* spiral freezers feature a self stacking belt which functions as a complete, self-contained freezing zone. The base-driven belt forms a closed tube through which the air flows down through the stack, minimizing freezing time and making it impossible for even lightweight or round products to be blown off the belt. Another feature of the Frigoscandia line is their semi-prefabricated modular assembly which means the freezer can be up and running in ten working days.

Freezing Systems, Inc. has a flow-through individual quick freezing tunnel that uses two belts to carry product through the freezer. On the first belt, refrigerated air blows up through the product and condi-

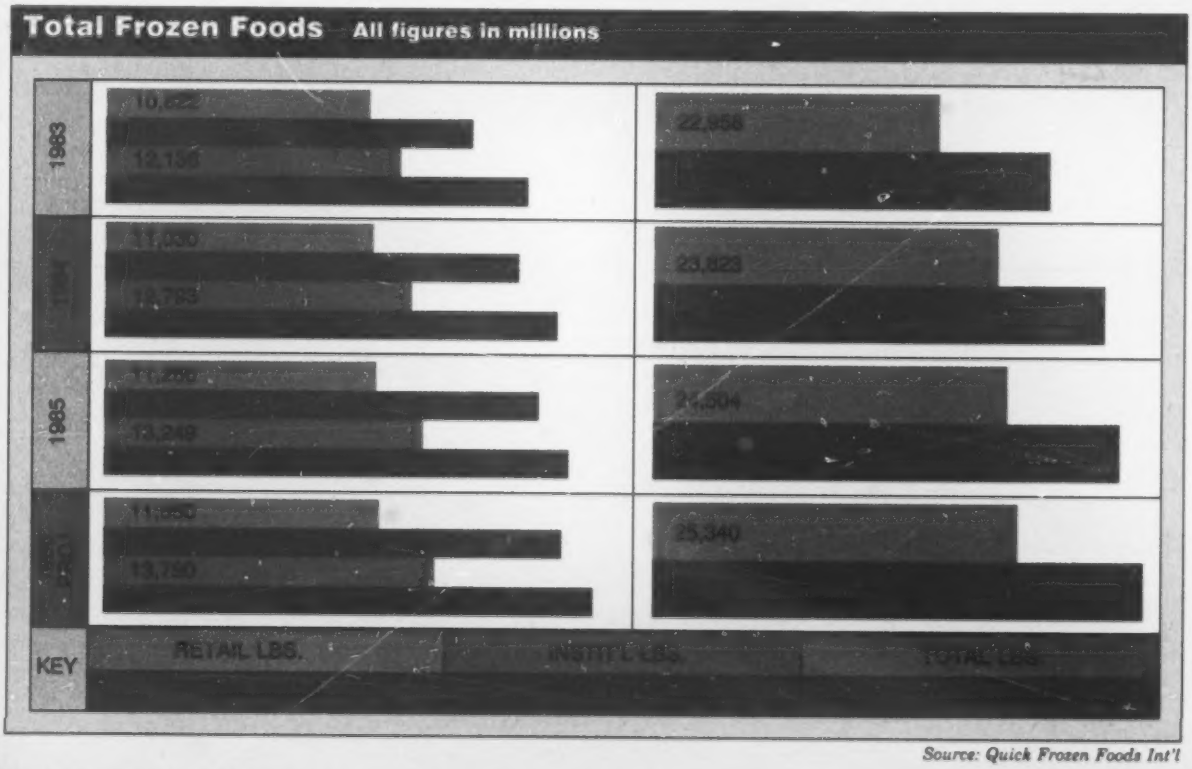
(Continued on page 90)

Value of All U.S. Frozen Foods All figures in millions



Source: Quick Frozen Foods Int'l

Total Frozen Foods All figures in millions



Source: Quick Frozen Foods Int'l

tions it for deep bed fluidizing. Final freezing takes place on the second belt. Individual control of belt speeds allows the unit to handle a variety of products.

Other systems

Contact plate freezers work well with flat packages where the plates achieve maximum contact with the product. Product packages are loaded in tiers, with the contact plates between the tiers. The refrigerant flows through the plates allowing rapid freezing of the product. The fast freezing helps maintain desired product characteristics such as texture and flavor. Crepaco and Frigoscandia, among others offer continuous plate freezing systems.

Under development by Refrigeration Engineering Co., are brine spray freezers for use with shell-on shrimp and other products. This provides much fresher looking product without the expense of removing the shells. With this method, the result is individually frozen shrimp.

Liquid Carbonic and Liquid Air Corp., both feature liquid nitrogen tunnel freezers. Liquid Carbonic features a straight line configuration with either under-the-belt cooling or combined top and bottom cooling for IQF applications. Liquid Air has introduced a tunnel that operates at -300° F, which they say reduces liquid nitrogen consumption by 20%.

An extension of the IQF idea has been presented by Frigoscandia. Individually frozen pellets bring the same kind of handling convenience to liquid and semi-liquid products as IQF does to solids. Product is frozen quickly by direct contact between two stainless steel belts in a continuous moving sandwich. The top belt in the line is flat and the lower belt, corrugated with flexible seals on both sides.

Product is applied to the corrugated belt by a spreading device, after which the flat belt is brought in contact with the product, thus totally enclosing it. Freezing time is 2½ to 5 minutes, depending on the type of product. The frozen product leaves the two belts in form of a "corrugated mat." The mat is sawed in 40mm wide strips which subsequently are split in the corrugations. The technique has been applied to meatslurry, liquid egg, vegetable puree, fruit pulps, dairy products and sauces. Any pumpable product is a candidate for pellet freezing.

Pre-chilling is an efficient way of improving freezer productivity. Garroutte's Waterfall Hydro-Chiller uses a three-stage process with a final chilling 33°F water cas-

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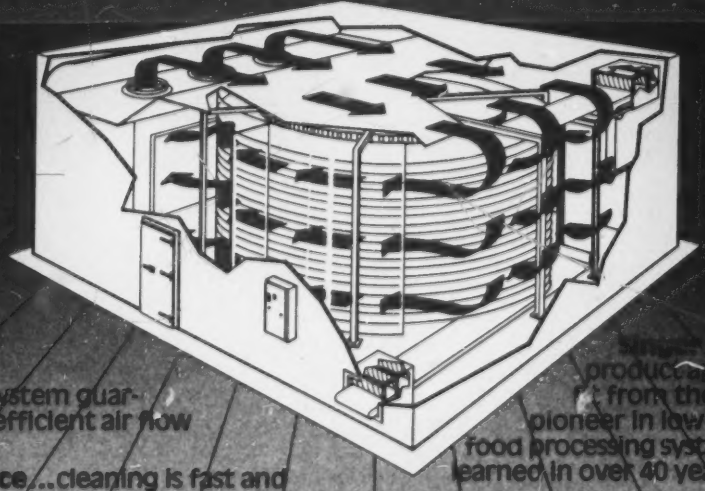
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Portability and modularity have become desired equipment traits so that equipment acquires a resale or trade-in value. This Cascade freezer from Refrigeration Engineering is completely assembled and ready-to-ship.

cade. According to Garroutte, freezing units can then do more product per hour with one-third the refrigeration horsepower.

Selecting a freezer

There are more costs involved in the freezing process than just the price of the freezer. The cost of freezing, energy costs, manpower, maintenance, downtime, and product dehydration are all very important items to be considered in freezer selection.

Other questions to be asked are: Is the unit compact or will it require a whole new building? Is it easy to operate? Does its design offer room for capacity expansion or will a second or replacement unit be required? Is it mobile? Is there a modular or plug-in design that offers resale value? Does it provide the best yield? Is the value of the product enhanced by freezing in this unit? If these questions are not included in cost calculations, there could be a rude awakening down the line.

Whatever the system used, whatever the product, processors are gearing to a market-driven, rather than a production-driven position to achieve success.

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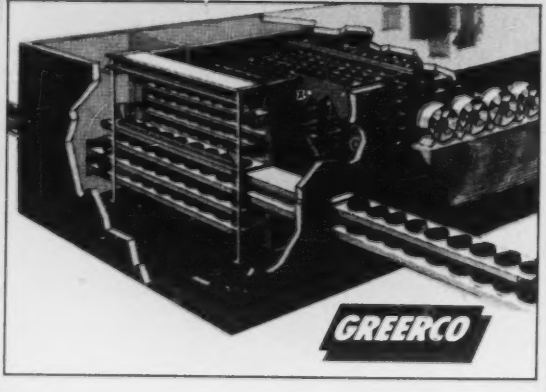

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Insert 50 or see FEM, p. 176